

Remarks/Arguments

Responsive to paragraph 2 of the Office Action, replacement sheets containing corrected Figs. 2A and 2B, Fig. 3 and Figs. 4A and 4B are enclosed herewith.

Responsive to paragraph 3 of the Office Action, "onion-like" has been removed from the Abstract, the drawing descriptions have been amended, and a new and clearer Fig. 3 is submitted herewith. With respect to Fig. 3, it is in fact a photograph showing a field test. White clouds on the right side of the picture (a) are explosions of initial charges, whereas dark clouds on the left side of the picture (b) are simultaneous explosions of primary and secondary charges. Although the primary charges alone are much heavier than the initial charges, the clouds of material thrown upwards by combined primary and secondary charges are obviously smaller than the clouds for said initial charges, because the onion cavity of the invention causes the impact to be directed to all spatial directions, and the energy is absorbed by pulverizing the surrounding rock. That is what can be learned from the photo, which is believed to be useful, and applicant, noting that the new copy of the photo is clearer than the copy originally available to the Examiner, prefers to keep Fig. 3 in the application.

Claims 5, 10, 13, 14 and 15 have been cancelled and claim 8 is amended to be dependent on claim 1 thereby resolving the matter of the rejection of these claims under 35 USC 112.

Reconsideration of the rejection of claims 1-17 under 35 USC 112 for the reasons given in paragraph 6 of the Office Action is respectfully requested. The term "onion-like" has

been removed from claim 1 and the reference to "onion" has been reworded in accordance with the description in the application. The complete drill hole of the invention, as seen e.g. in Figure 2, is called "onion-shaped drill hole" or "onion drill hole", and its lowermost portion is called "close-to-spherical portion" or "close-to-spherical cavity" or "onion". The "close-to-spherical" wording is supported on page 4 of the application. In addition, claim 1 (step b.2) has been amended to characterize the initial explosive charge as much smaller than the primary explosive charge, which is supported on page 6 of the application. As for the amendments effected in step c) of claim 1, the "detonation . . . directed essentially evenly to all directions" is supported on page 11, and "pulverizing the rock mass and disintegrating the rocks at the surface" is supported on page 6. Step b.1 of claim 1 has been amended to incorporate a part of original claim 2. Claims 5, 11, 13, 16 and 17 have been cancelled.

Reconsideration of the rejection of claims 1, 2, 7, 10-12, 14 and 16 under 35 USC 102 based on Aitchison is respectfully requested for the following reasons.

The Aitchison patent is considered by the Examiner to disclose the present blasting method, including array of holes, imparting onion shape to each hole, filling the holes with two explosive charges and two buffer layers, detonating primary and secondary charges. However, the cited passages in Aitchison do not seem to relate directly to the recited elements. The patent teaches inflatable expansible plastic tube for filling a drill hole with freely flowing explosives obviating water seepage (line 41 at col. 1). The inflatable tube should contact the

side walls of the hole (claim 1), and therefore any expansions in the cylindrical shaft should not much exceed the diameter for the cylinder, otherwise the plastic tube could not be inflated as claimed in claim 1 and as shown in figures 4-6. An onion of the instant invention has a diameter much larger than the diameter of the cylindrical part (e.g., 1 meter compared to 8 inches). The shapes of the drill holes in the Aitchison patent are entirely different from the instant shape, e.g. as shown in figure 2a. Any expanded sections disclosed in the patent are not created by explosions of initial small charges, as in the present invention, and the expanded sections of the Aitchison patent are not intended to direct the blast evenly to all directions, as in the case of close-to-spherical "onions" of the instant invention.

Nevertheless, the present amendments of claim 1 have made the differences between the instant invention, as described in claim 1, and the Aitchison patented invention still clearer. A blasting method for open mines and excavations comprising an array of onion drill holes of this invention has nothing to do with a method for charging a flowing explosive into a blast hole. The former is a blasting method, the latter is a filling method; the former has an array of drill holes, the latter a hole; the former has one lowermost, close-to spherical extension with a diameter much larger than the cylindrical part, the latter has any number of extensions (e.g., claim 12) situated in any height (Fig. 3); the former uses an initial, relatively small charge to create the spherical extension, the latter uses flame piercing (line 45 at col. 1); the former pulverizes the rock around the extension, as well as on the surface, the latter reduces danger of premature explosion (line 51 at col. 1); etc.

It is, therefore, believed that the cited Aitchison patent does not anticipate the instant invention defined in amended claims 1, 7 and 12.

Reconsideration of the rejection of claims 1, 2, 4, 10, 13 and 14 under 35 USC 102 based on Rawson is respectfully requested for the following reasons. Rawson teaches excavating by means of nuclear explosions. The main goal of blasting is not excavating and pulverizing in open mines, as in the instant application, but to dig an underground cavity, and to create an underground permeable zone or void region (lines 21-51 at col. 1).

The similarity between the methods, mentioned by the Examiner, seems quite superficial. Rawson is stated to disclose the subject matter of claim 2 (relating to the initial charge creating the onion) at lines 37-56 of col. 6, when relating to springing; however, initial charge of 12-15 kg (page 6 of the instant application) is principally different from a few tens of tons (line 42 at col. 6). Similarly, amended claim 4 depends from claim 1, and therefore cannot be disclosed in lines 26-27 at col. 4 only because the lines mention "suitable plug", and instant claim 4 mentions stemming. Combined nuclear and chemical explosions (claim 1), drilled and spaced about 700 feet from each other (line 12 at col. 6) do not remind or anticipate an array of classical explosions 18 meters from each other, neither a delay 1 second between two explosions in the patent (claim 1) reminds the simultaneous explosions of primary and secondary charges, nor a chimney 100 feet or more in diameter (line 6 at col. 3) reminds the instant cylindrical upper portion.

It is, therefore, believed that the cited Rawson patent does not anticipate the instant invention defined in amended claims 1 and 4.

Reconsideration of the rejection of claims 1-8, 10-12, 14 and 16 under 35 USC 103 based on Aitchison in view of Grant is respectfully requested for the following reasons. The Examiner indicates that Grant makes obvious imparting an onion shape to the drill hole as described in claim 2, citing lines 4-23 of col. 4 and figures 1 and 2. Although one can agree with the Examiner that the art of springing had been known, creating the onion is only one of steps in realizing the instant invention of claim 1, which is, after the current amendments, blasting method for open mines comprising an array of onion drill holes, and wherein the charge pulverizing the rock (primary charge) is much larger than the initial charge (creating the onion). Dependent claims 4 and 6 (claim 5 has been canceled) describe certain embodiments of the invention of claim 1, and, although the aspects are related to in the cited passages, the precise values are not disclosed in the Grant patent: 80-90% called for in claim 6 (dependent from claim 1) is not disclosed by "approximate depth" in cited lines 41-42 at col. 3 of Grant.

With regard to claim 8, while Grant teaches some geometrical features of cavities created by underground explosions which may be utilized, and when excavating ratio of diameters for cylindrical/spherical parts might be calculated from the cited document, but Grant's mathematical teaching, even if combined with Aitchinson's inflatable tube, does not make obvious the instant array of onions for open mines and excavations, comprising three different explosive charges and

two buffer layers according to applicant's invention.

Reconsideration of the rejection of claims 1-8, 10-12, 14 and 16 under 35 USC 103 based on Aitchinson as modified by Grant in view of Avanci is respectfully requested for the following reasons. The Examiner admits that the ratio values of instant claim 7 are not disclosed in the cited documents, but assumes that these values would be easily derived by a skilled person. However, even the cited passages show how difficult it would have been to come to the values claimed in the instant application when combining the values inferred from the prior art. Avanci is cited as giving 10 and 30m for the depth (lines 51 to 52), but he also gives 25 to 60 mm for the shot hole - corresponding to the instant cylindrical diameter of 8 inches. Even a retrospective search for values similar to the instant values would not provide the instant 13 meter depth and 200 mm diameter of instant claim 7 from Avanci's 10-30 m and 25-60 mm. Anyway, it is believed that Avanci's method for geological tests would hardly lead a skilled person, searching for novel surface excavations, to the present invention.

Reconsideration of the rejection of claim 9 under 35 USC 103 based on Aitchison in view of Grant and admitted prior art is respectfully requested for the following reasons. The Examiner states that instant Figure 4 implies that the instant distances (Fig. 4a, claim 9) would be easily derived from the prior art distances as shown in Fig. 4b. The Applicant wishes to note that claim 9 represents one of embodiments, and the drawing intends to illustrate the fact that the invention enables, due to higher efficiency and impact of the method, using lower number of drill holes, when compared to prior art

drilling methods used in open mines and excavations (as also referred to in Background of the Invention).

In conclusion, the combination of features providing an efficient and cheap blasting method of this invention is not obvious from the cited prior art. For example, the cited values of distances and diameters are selected from many other possible values; Avanci might be cited as giving 3 m (10 feet, line 46 at col. 5) for the onion height, and Grant as giving 26-60 mm for the cylindrical diameter, whereas the instant invention prefers 1 m and 200 mm. However, it is not the combination of dimensions that makes the instant method more efficient and cheaper for blasting in open mines and excavations, but the combination of other features. This invention has attained objects of reducing amounts of explosives, number of drilling holes, and costs of drilling during blasting larger areas (instant pages 3 and 16). None of the cited prior art documents, a one or in combination, can teach a skilled person a combination of the following elements:

- the blasting method for open mines and excavations,
- using an array of onion-shaped drill holes having cylindrical upper part and lowermost near-to-spherical part,
- employing three different charges initial charge, primary charge, and secondary charge, wherein the initial charge, creating the lowermost part, is much smaller than the primary charge, and two buffer layers, and

- simultaneously detonating the primary and secondary charges, thereby pulverizing the rock mass between the lowermost part and the ground surface.

It is, therefore, respectfully submitted that amended claim 1 and dependent claims 2-4, 6-9 and 12 define a novel and inventive blasting method for open mines and excavations.

Favorable action on this application is respectfully
requested.

Respectfully submitted,

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Amendments to the Drawings:

Please replace the original sheet of drawing containing Figs. 2 and 2b with the enclosed new drawing sheet wherein Fig. 2 has been changed to Fig. 2a and Fig. 2b has been changed to Fig. 2b.

Please replace the original sheet of drawing containing Fig. 3 with the enclosed new drawing sheet containing Fig. 3 which is of greater clarity.

Please replace the original sheet of drawing containing Fig. 4 with the enclosed new drawing sheet containing Figs. 4A and 4B wherein Fig. 4A has been labeled as prior art.

Attachment: Three Replacement Sheets